

33. BANKER'S DISCOUNT

IMPORTANT CONCEPTS

Banker's Discount : Suppose a merchant A buys goods worth, say Rs. 10,000 from another merchant B at a credit of say 5 months. Then, B prepares a bill, called the bill of exchange. A signs this bill and allows B to withdraw the amount from his bank account after exactly 5 months.

The date exactly after 5 months is called nominally due date. Three days (known as grace days) are added to it to get a date, known as legally due date.

Suppose B wants to have the money before the legally due date. Then he can have the money from the banker or a broker, who deducts S.I. on the face value (i.e., Rs. 10,000 in this case) for the period from the date on which the bill was discounted (i.e., paid by the banker) and the legally due date. This amount is known as Banker's Discount (B.D.) Thus, B.D. is the S.I. on the face value for the period from the date on which the bill was discounted and the legally due date.

Banker's Gain (B.G.) = (B.D.) - (T.D.) for the unexpired time.

Note : When the date of the bill is not given, grace days are not to be added.

IMPORTANT FORMULAE

1. B.D. = S.I. on bill for unexpired time.
2. B.G. = (B.D.) - (T.D.) = S.I. on T.D. = $(T.D.)^2 / P.W.$
3. T.D. = $\sqrt{(P.W. \times B.G.)}$
4. B.D. = $[(\text{Amount} \times \text{Rate} \times \text{Time}) / 100]$
5. Amount = $[(B.D. \times T.D.) / (B.D. - T.D.)]$
6. T.D. = $[(\text{Amount} \times \text{Rate} \times \text{Time}) / (100 + (\text{Rate} \times \text{Time}))]$
7. T.D. = $[(B.G. \times 100) / (\text{Rate} \times \text{Time})]$

SOLVED EXAMPLES

Ex. 1. A bill for Rs. 6000 is drawn on July 14 at 5 months. It is discounted on 5th October at 10%. Find the banker's discount, true discount, banker's gain and the money that the holder of the bill receives.

Sol.

Face value of the bill = Rs. 6000.

Date on which the bill was drawn = July 14 at 5 months. Nominally due date = December 14.

Legally due date = December 17.

Date on which the bill was discounted = October 5.

Unexpired time : Oct. Nov. Dec.
 26 + 30 + 17 = 73 days = 1/5 Years

$$\begin{aligned}\text{B.D.} &= \text{S.I. on Rs. 6000 for } 1/5 \text{ year} \\ &= \text{Rs. } (6000 \times 10 \times 1/5 \times 1/100) = \text{Rs. 120.}\end{aligned}$$

$$\begin{aligned}\text{T.D.} &= \text{Rs. } [(6000 \times 10 \times 1/5) / (100 + (10 \times 1/5))] \\ &= \text{Rs. } (12000 / 102) = \text{Rs. 117.64.}\end{aligned}$$

$$\text{B.G.} = (\text{B.D.}) - (\text{T.D.}) = \text{Rs. } (120 - 117.64) = \text{Rs. 2.36.}$$

$$\begin{aligned}\text{Money received by the holder of the bill} &= \text{Rs. } (6000 - 120) \\ &= \text{Rs. 5880.}\end{aligned}$$

Ex. 2. If the true discount on a certain sum due 6 months hence at 15% is Rs. 120, what is the banker's discount on the same sum for the same time and at the same rate?

$$\begin{aligned}\text{Sol. } \text{B.G.} &= \text{S.I. on T.D.} \\ &= \text{Rs. } (120 \times 15 \times 1/2 \times 1/100) \\ &= \text{Rs. 9.} \\ (\text{B.D.}) - (\text{T.D.}) &= \text{Rs. 9.} \\ \text{B.D.} &= \text{Rs. } (120 + 9) = \text{Rs. 129.}\end{aligned}$$

Ex. 3. The banker's discount on Rs. 1800 at 12% per annum is equal to the true discount on Rs. 1872 for the same time at the same rate. Find the time.

$$\begin{aligned}\text{Sol.} \\ \text{S.I. on Rs. 1800} &= \text{T.D. on Rs. 1872.} \\ \text{P.W. of Rs. 1872} &\text{ is Rs. 1800.} \\ \text{Rs. 72 is S.I. on Rs. 1800 at 12\%.} \\ \text{Time} &= [(100 \times 72) / (12 \times 1800)] \text{ year} \\ 1/3 \text{ year} &= 4 \text{ months.}\end{aligned}$$

Ex. 4. The banker's discount and the true discount on a sum of money due 8 months hence are Rs. 120 and Rs. 110 respectively. Find the sum and the rate percent.

$$\begin{aligned}\text{Sol.} \\ \text{Sum} &= [(\text{B.D.} \times \text{T.D.}) / (\text{B.D.} - \text{T.D.})] \\ &= \text{Rs. } [(120 \times 110) / (120 - 110)] \\ &= \text{Rs. 1320.}\end{aligned}$$

$$\begin{aligned}\text{Since B.D. is S.I. on sum due, so S.I. on Rs. 1320 for 8 months is Rs. 120.} \\ \text{Rate} &= [(100 \times 120) / (1320 \times 2/3)] \% \\ &= 13 \frac{7}{11} \%. \end{aligned}$$

Ex. 5. The present worth of a bill due sometime hence is Rs. 1100 and the true discount on the bill is Rs. 110. Find the banker's discount and the banker's gain.

$$\begin{aligned}\text{Sol. } \text{T.D.} &= \sqrt{(\text{P.W.} \times \text{B.G.})} \\ \text{B.G.} &= (\text{T.D.})^2 / \text{P.W.} \\ &= \text{Rs. } [(110 \times 110) / 1100]\end{aligned}$$

$$= \text{Rs. } 11.$$

$$\text{B.D.} = (\text{T.D.} + \text{B.G.}) = \text{Rs. } (110 + 11) = \text{Rs. } 121.$$

Ex. 6. The banker's discount on Rs. 1650 due a certain time hence is Rs. 165. Find the true discount and the banker's gain.

Sol.

$$\begin{aligned} \text{Sum} &= [(\text{B.D.} \times \text{T.D.}) / (\text{B.D.} - \text{T.D.})] \\ &= [(\text{B.D.} \times \text{T.D.}) / \text{B.G.}] \\ \text{T.D.} / \text{B.G.} &= \text{Sum} / \text{B.D.} \\ &= 1650 / 165 \\ &= 10 / 1 \end{aligned}$$

Thus, if B.G. is Re 1, T.D. = Rs. 10.

If B.D. is Rs. 165, T.D. = Rs. 165.

$$\begin{aligned} \text{If B.D. is Rs. } 165, \text{ T.D.} &= \text{Rs. } [(10/1) \times 165] \\ &= \text{Rs. } 1650 \end{aligned}$$

$$\text{And, B.G.} = \text{Rs. } (1650 - 150) = \text{Rs. } 150.$$

Ex. 7. What rate percent does a man get for his money when in discounting a bill due 10 months hence, he deducts 10% of the amount of the bill?

Solution: Let amount of the bill = Rs. 100

Money deducted = Rs. 10

Money received by the holder of the bill = Rs. 100 - 10 = Rs. 90

SI on Rs. 90 for 10 months = Rs. 10

$$\text{Rate} = [(100 \times 10) / (90 \times 10 / 12)]\% = 13 \frac{1}{3}\%$$